

Fiber-Based Electro-Optic Field-Mapping System

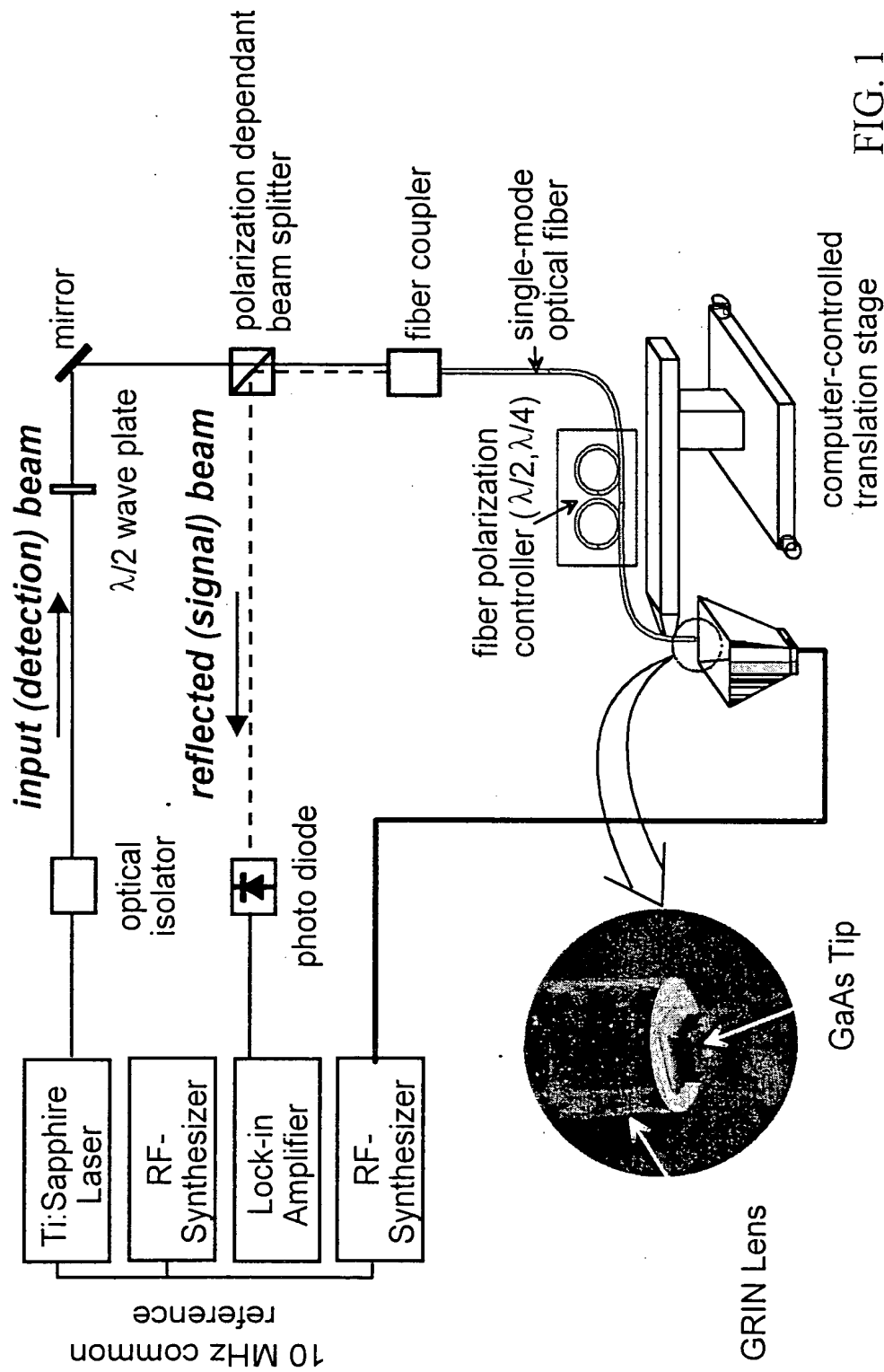


FIG. 1

Fiber-Based Electro-Optic Field-Mapping System Polarization Control

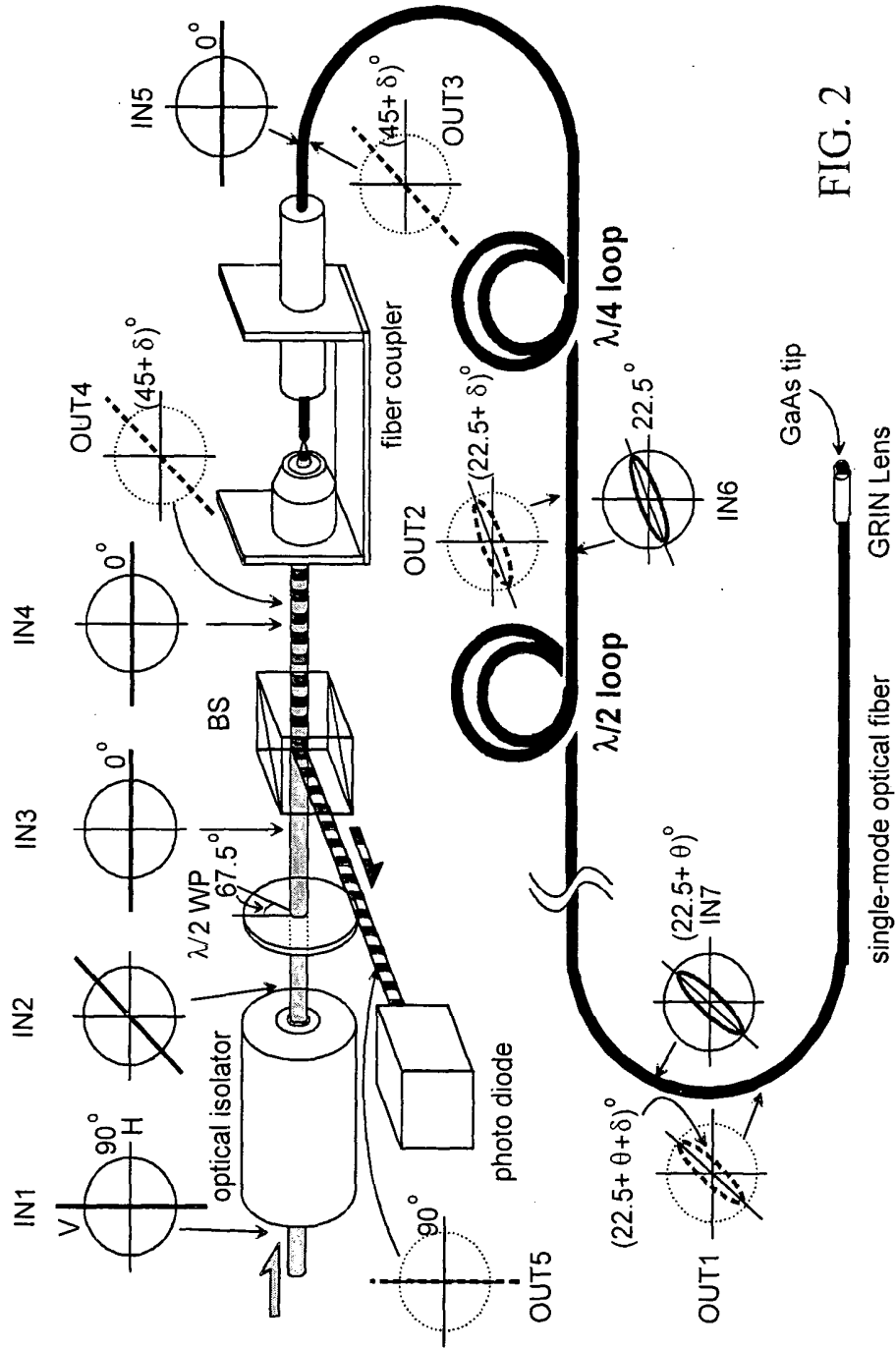


FIG. 2

detection (input) beam polarization (w.r.t. horizontal axis) 
 signal (reflected) beam (w.r.t. horizontal axis) 

Fiber-Based Electro-Optic Sampling System GRIN Lens

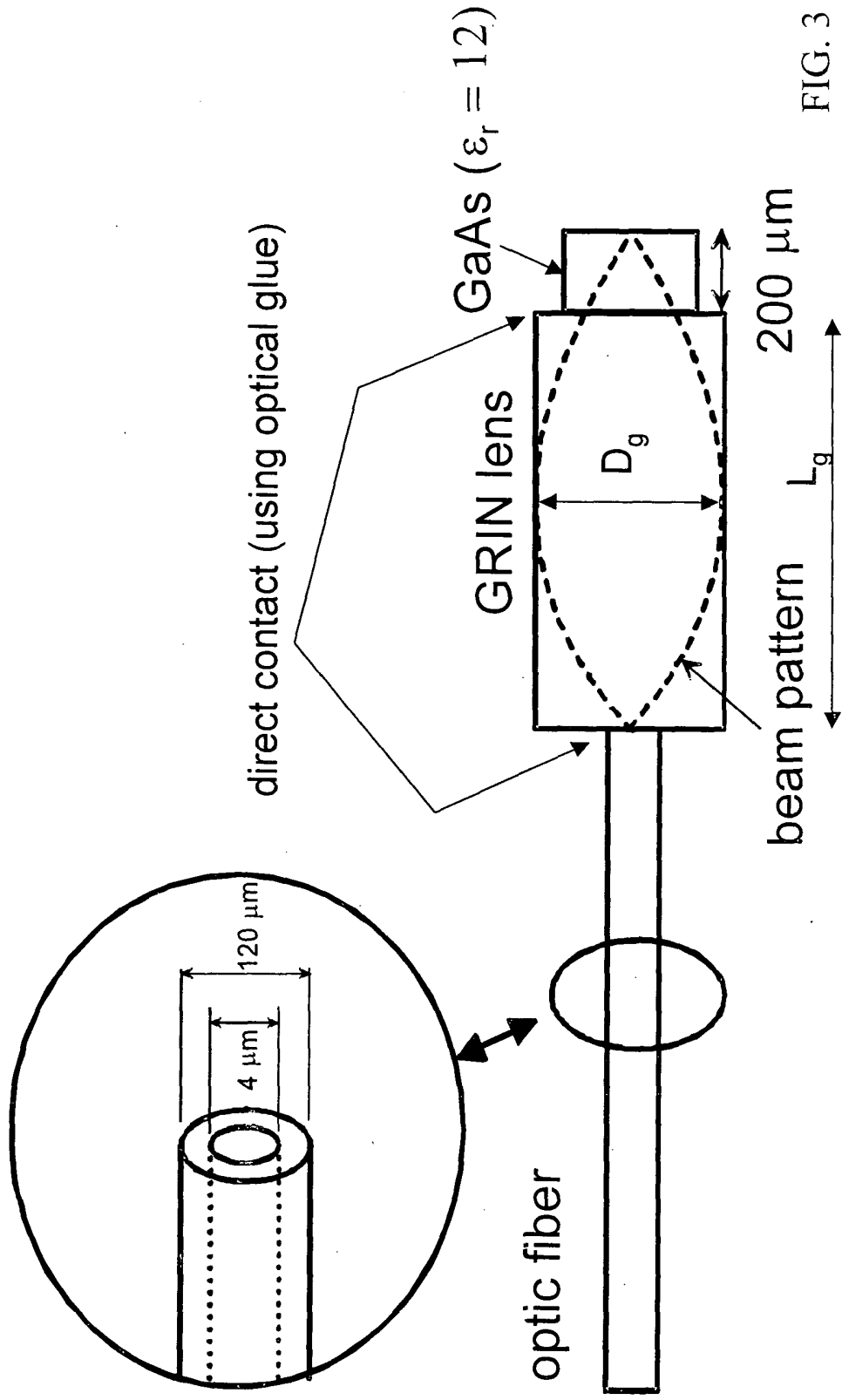
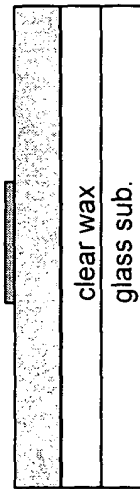


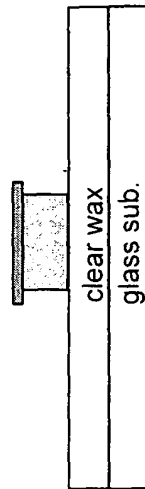
FIG. 3



PR 1827 : expose (15 sec), develop (50 sec),
hard bake (105 C, 1 min)



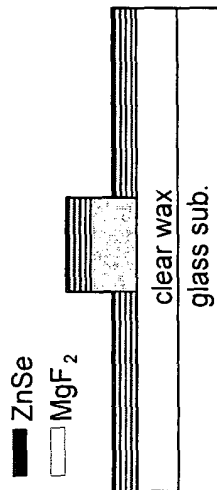
mount sample on glass substrate
using clear wax (on the 150 C^o hot plate)



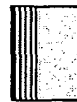
wet etching : $\text{H}_2\text{SO}_4 : \text{H}_2\text{O}_2 : \text{H}_2\text{O}$
 = 1 : 8 : 1
 + few drops of NH_4OH
 agitate 30 sec every 30 sec
 change etchant every 10 min.



expose without mask (15 sec), develope (90 sec)



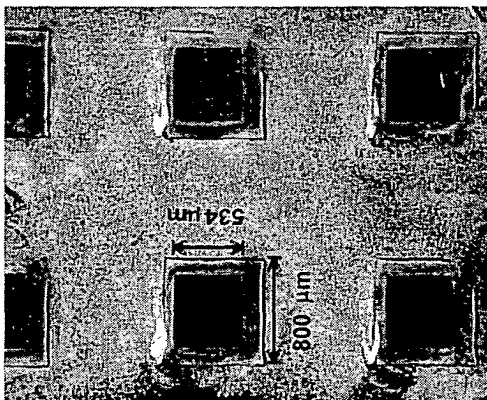
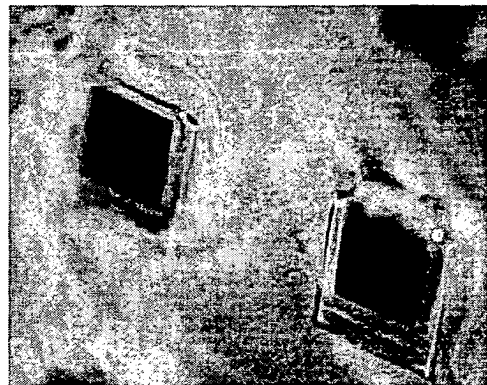
Distributed Bragg Reflector (DBR) deposition

$$\text{MgF}_2 = 1,403^\circ, \text{ZnSe} = 833^\circ \text{ A} \times 4 \text{ sets}$$


Final probe tip
(released in the hot acetone)

FIG. 4

Fiber-Based Electro-Optic Sampling System Probe Tip Fabrication - (100) GaAs



etching depth ~ 160 μm (7.95 μm/min x 20 min)
(lateral : 130~150 μm, 6.5~7.5 μm/min)

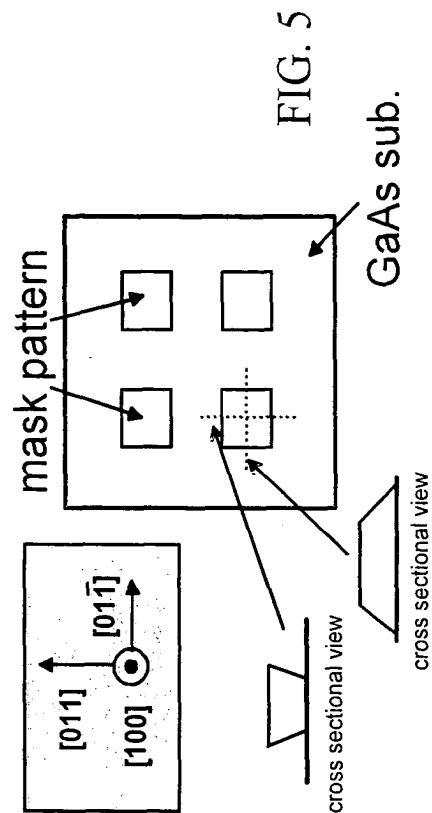
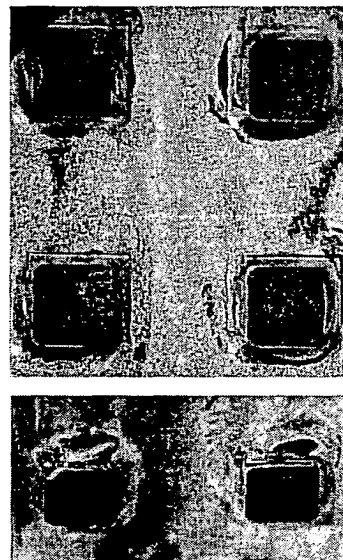
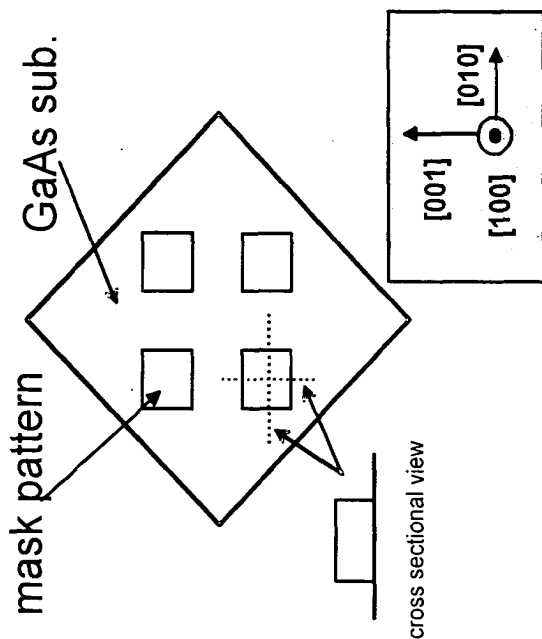


FIG. 5



Fiber-Based Electro-Optic Sampling System
Probe Tip Fabrication - (110) GaAs

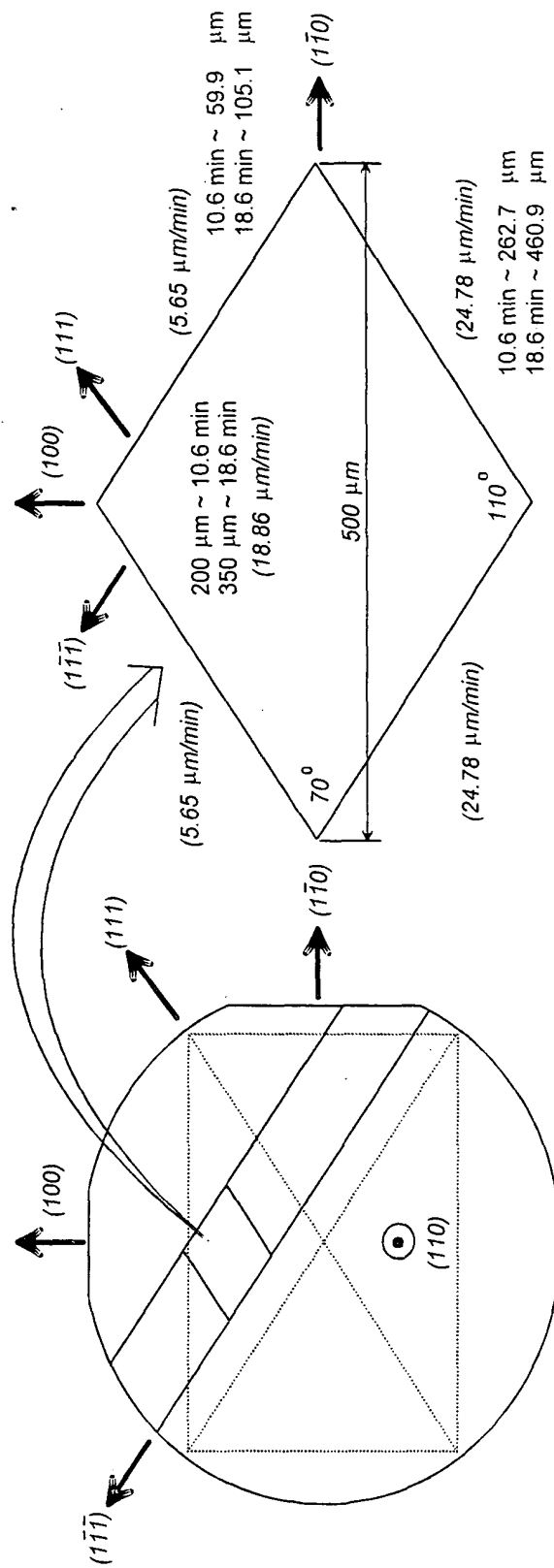
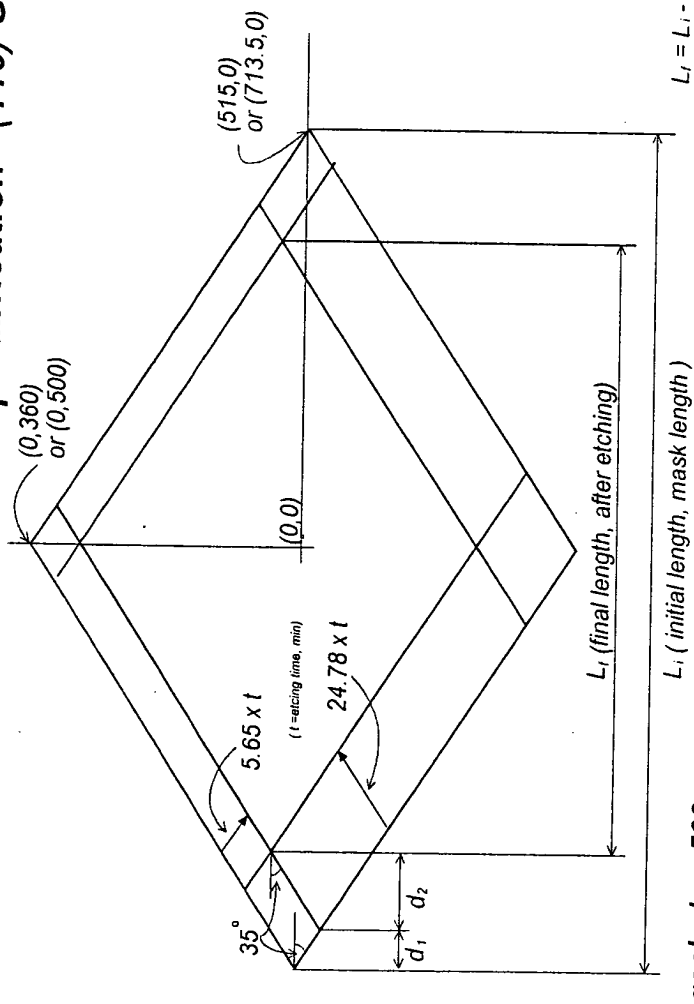


FIG. 6



Fiber-Based Electro-Optic Sampling System Probe Tip Fabrication - (110) GaAs



$$L_f = L_i - (d_1 + d_2) \times 2$$

$$L_f = L_i - [5.65 \times t \times \cos(35^\circ) + 24.78 \times t \times \sin(55^\circ)] \times 2 = 500$$

$$L_i = 500 + [5.65 \times \cos(35^\circ) + 24.78 \times \sin(55^\circ)] \times 2 \times t$$

where,

$$t = 200 / 18.86 \text{ (}\mu\text{m/min)} = 10.6 \text{ min for } 200 \text{ } \mu\text{m wafer}$$

$$t = 350 / 18.86 \text{ (}\mu\text{m/min)} = 18.6 \text{ min for } 350 \text{ } \mu\text{m wafer}$$

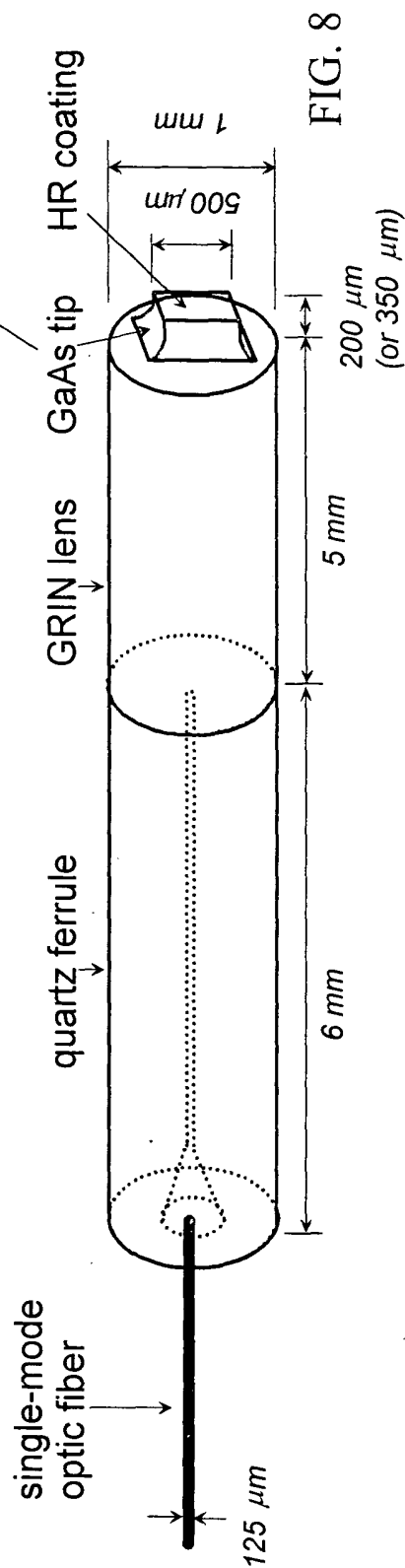
(t = etching time, min)

$$L_i = 1029 \text{ } \mu\text{m for } 200 \text{ } \mu\text{m wafer,}$$

$$= 1427 \text{ } \mu\text{m for } 350 \text{ } \mu\text{m wafer}$$

FIG. 7

Fiber-Based Electro-Optic Sampling System Probe Head Assembly



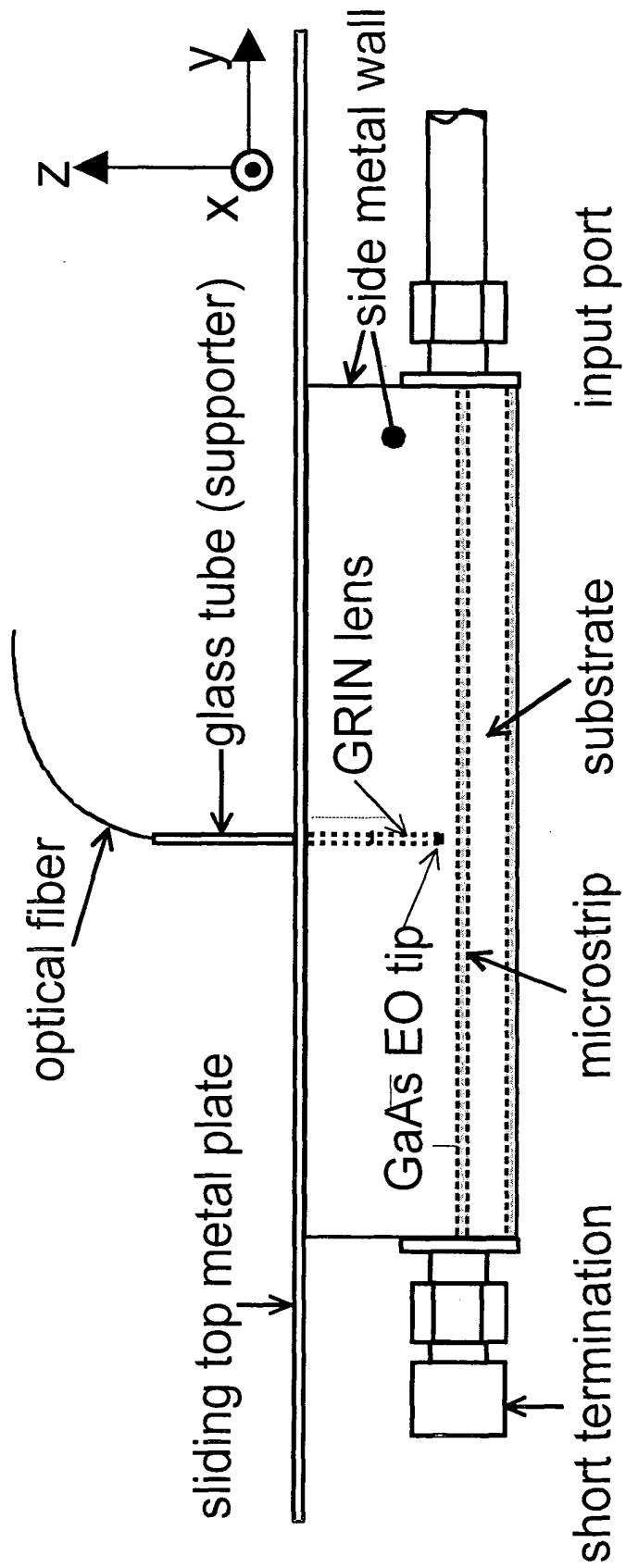


FIG. 9

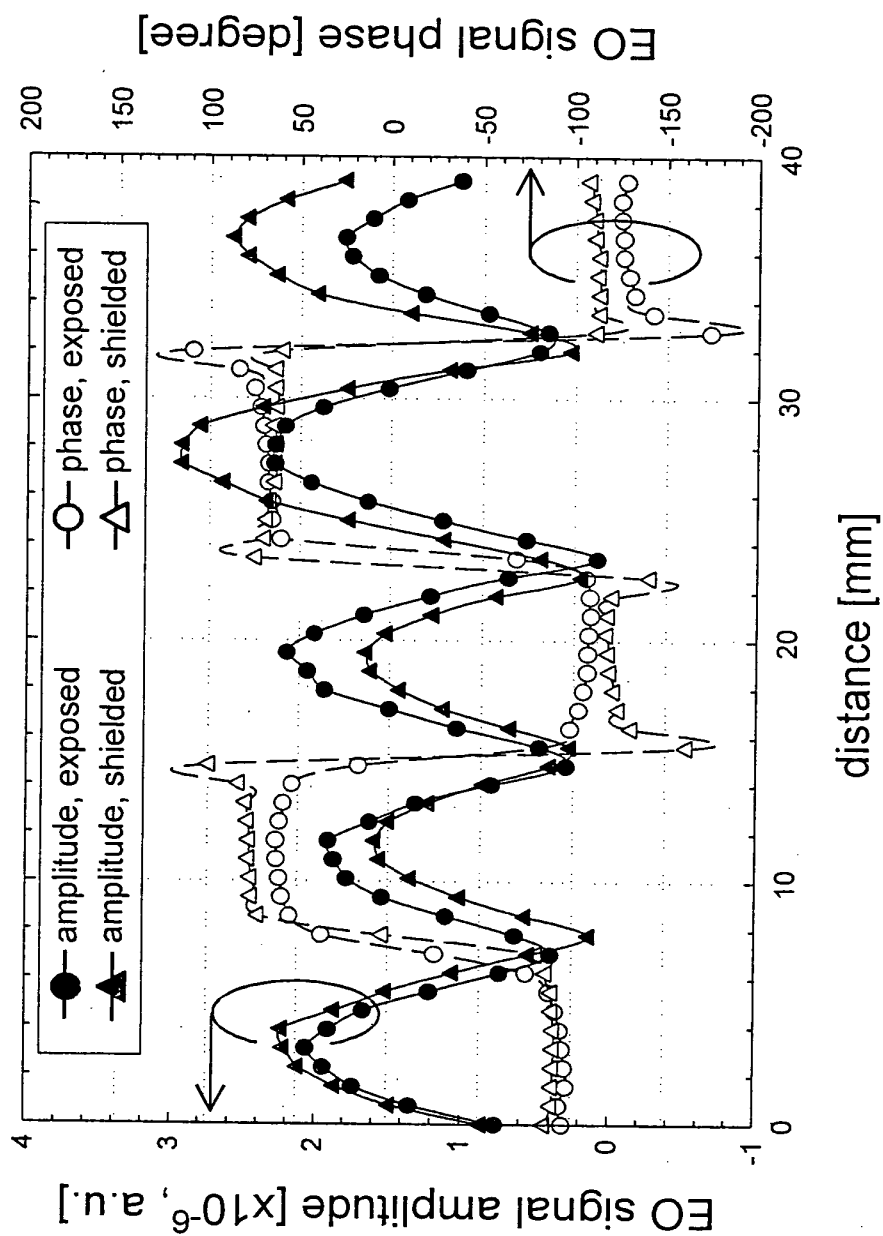


FIG. 10

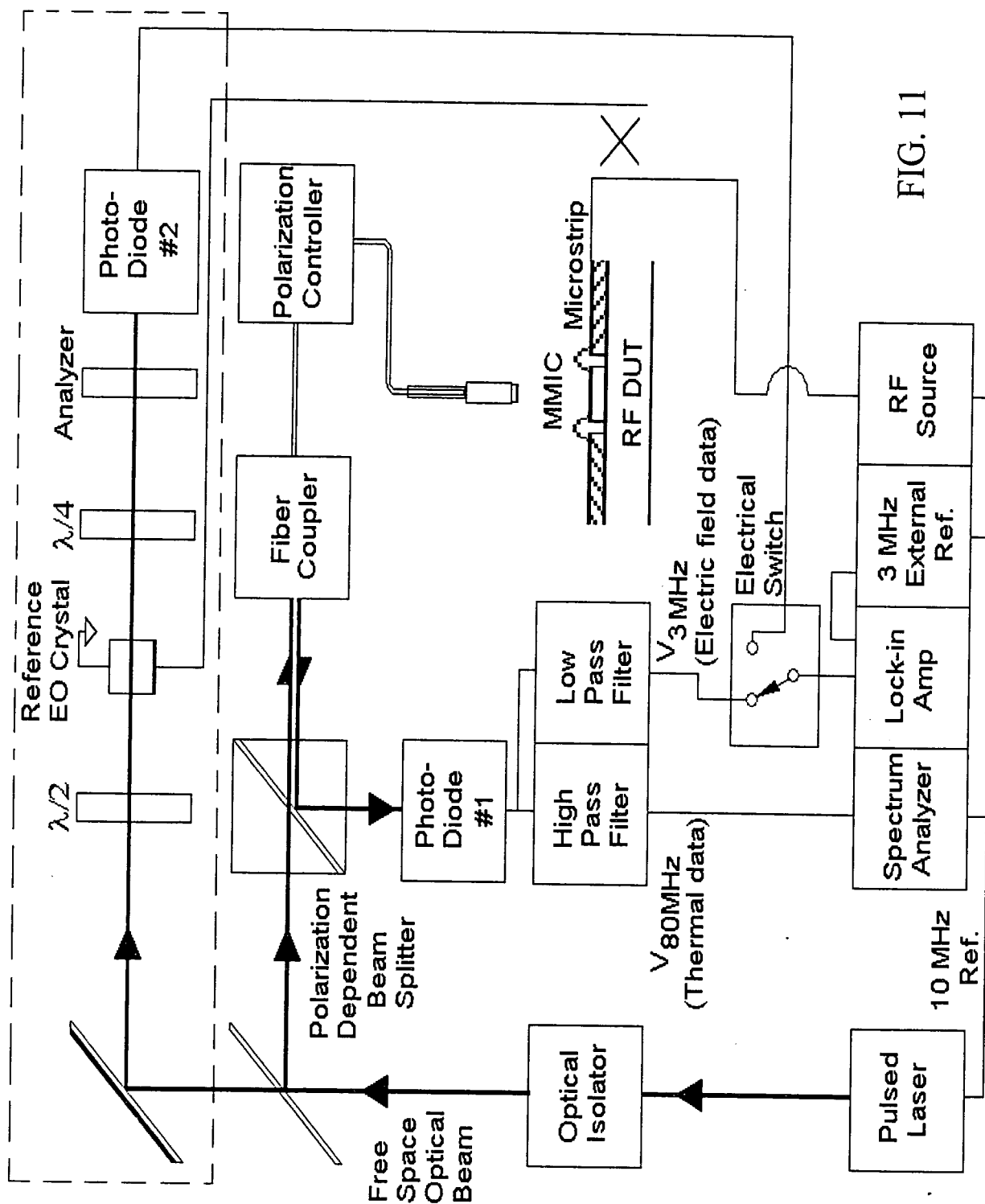


FIG. 11

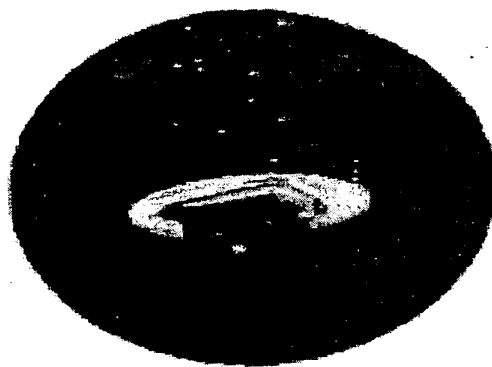


FIG. 12

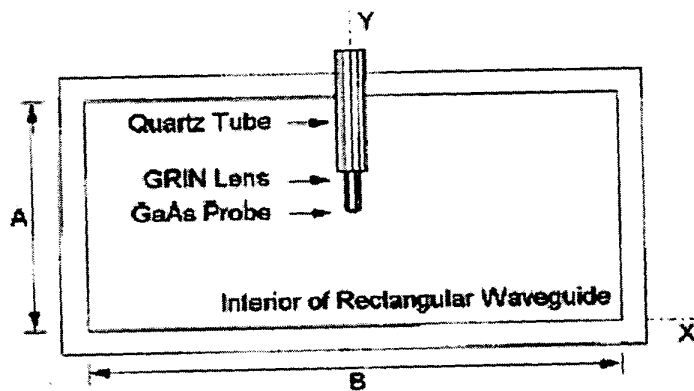


FIG. 13

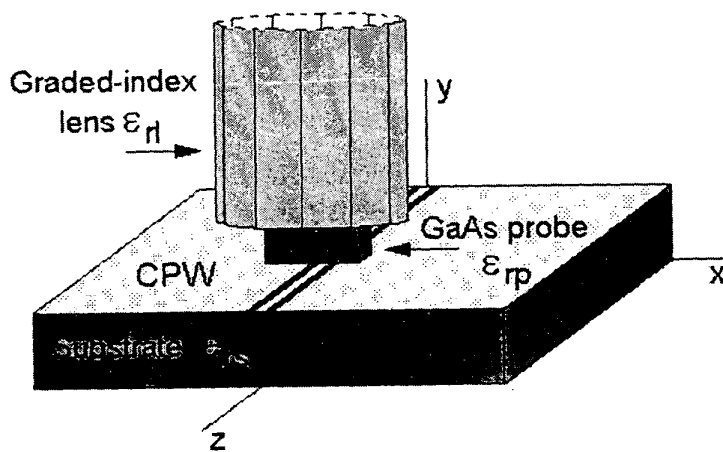
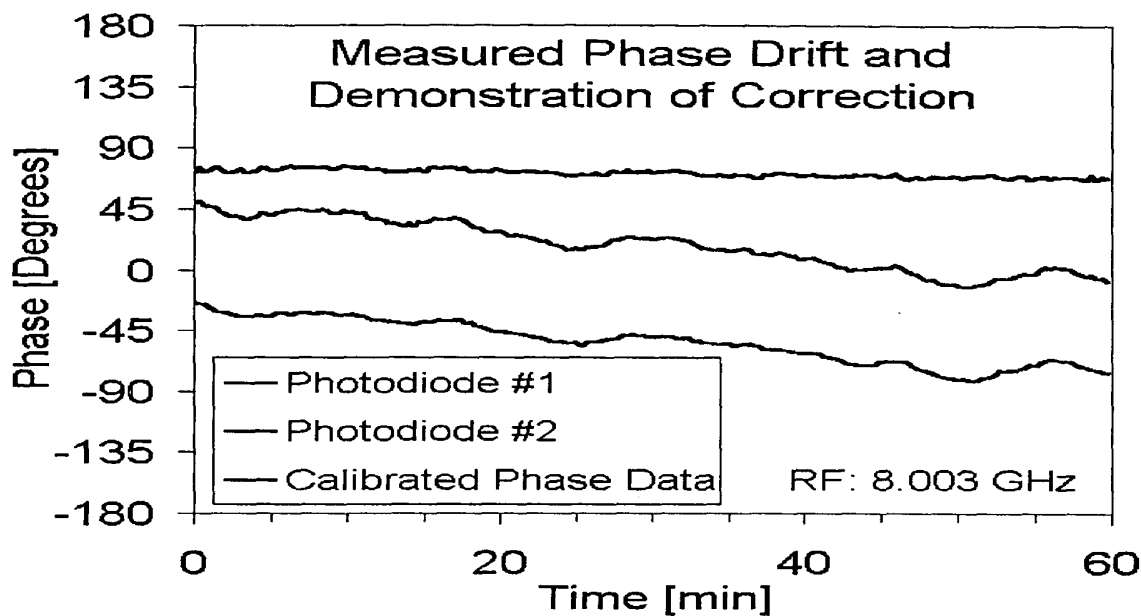


FIG. 14

CHARACTERIZATION – ELECTRIC FIELD PHASE



Over one hour, measured temporal phase stability is $\pm 3^\circ$

FIG. 15

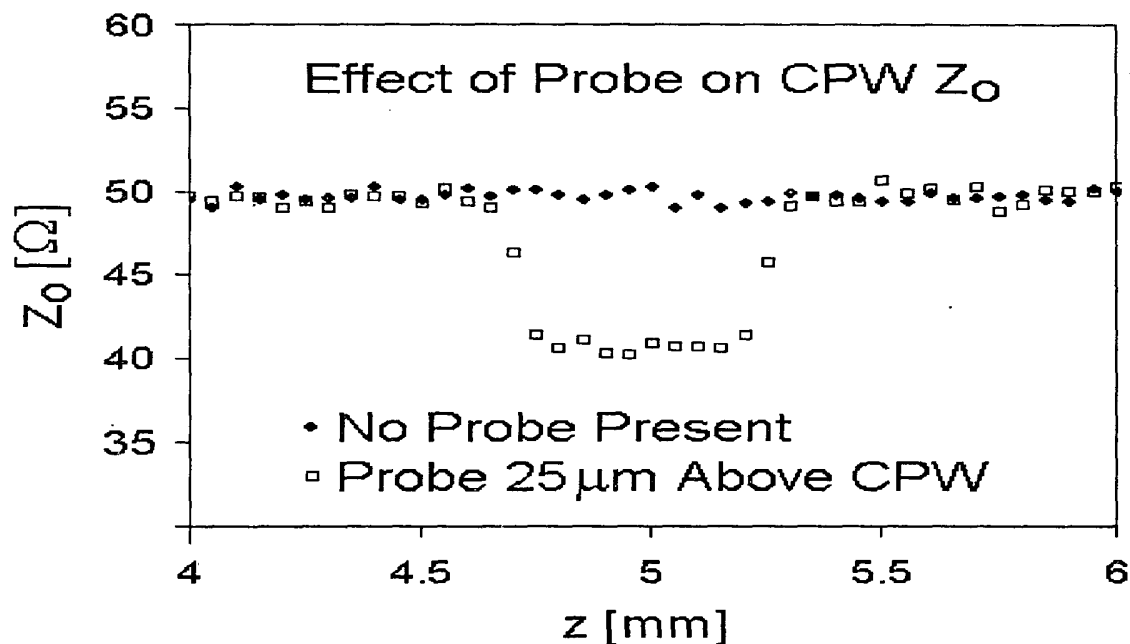
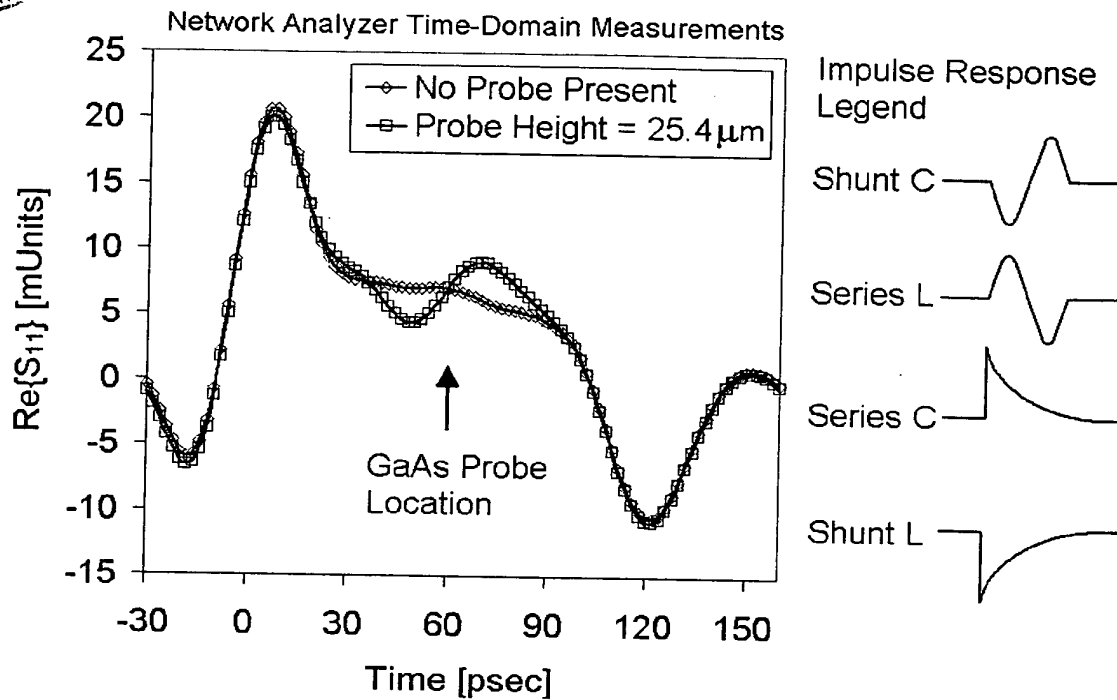


FIG. 16



- Frequency domain measurements (2 - 40 GHz):
|S₁₁| < -30 dB with and without probe.

FIG. 17

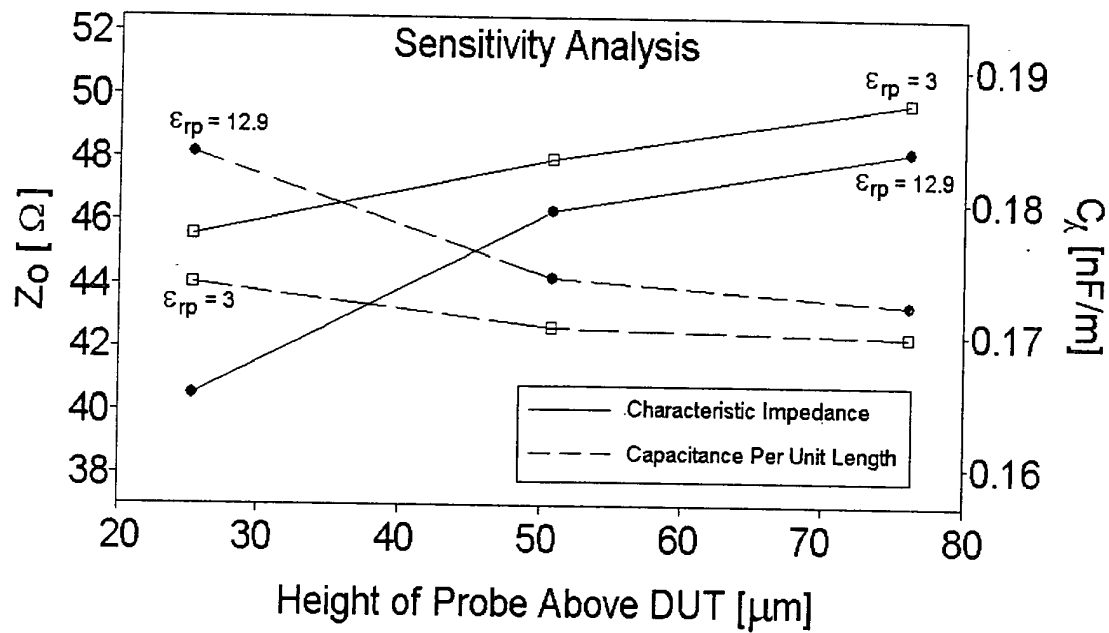


FIG. 18

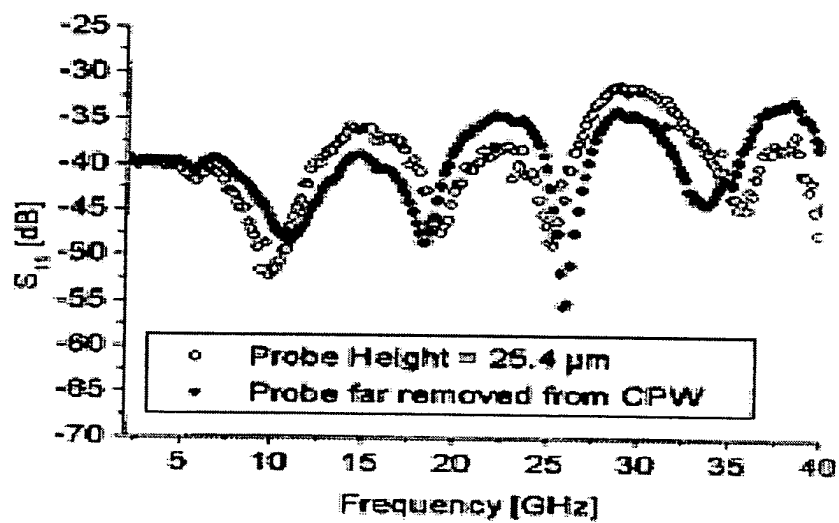


FIG. 19

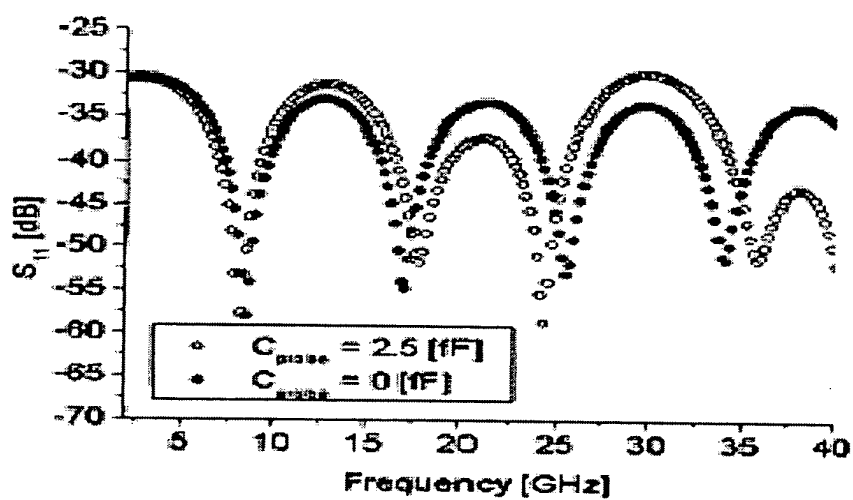


FIG. 20

Probe Vs Power Meter

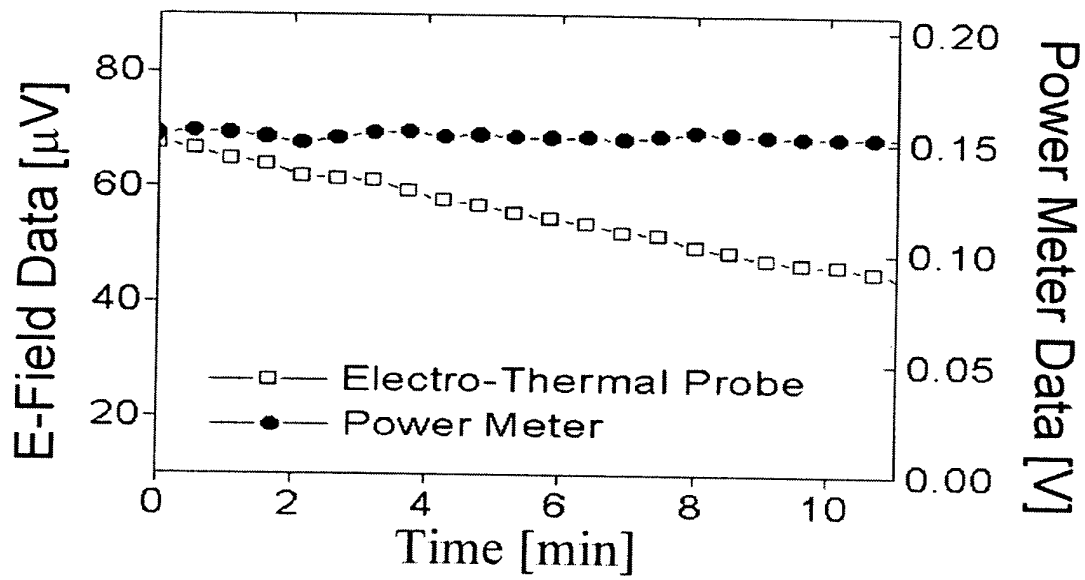


FIG. 21

Modulation Vs Absorption

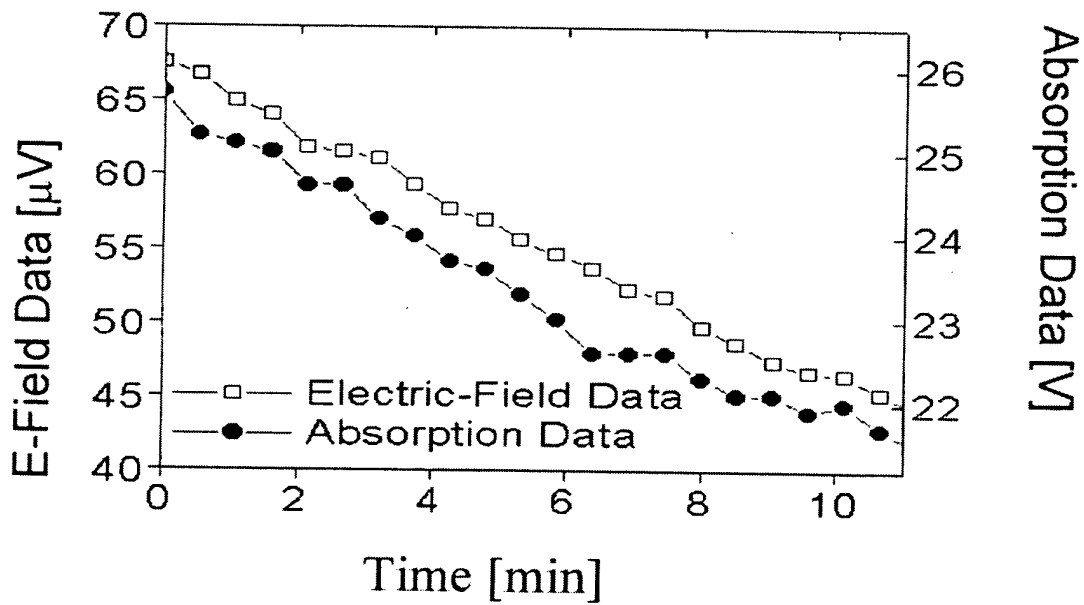


FIG. 22

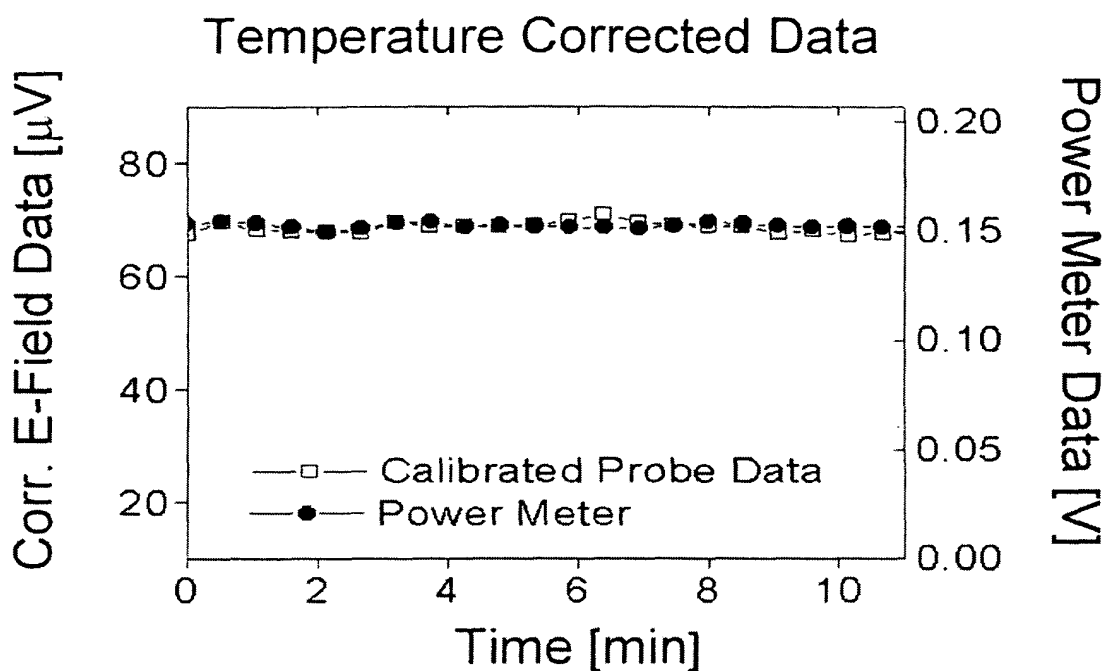


FIG. 23

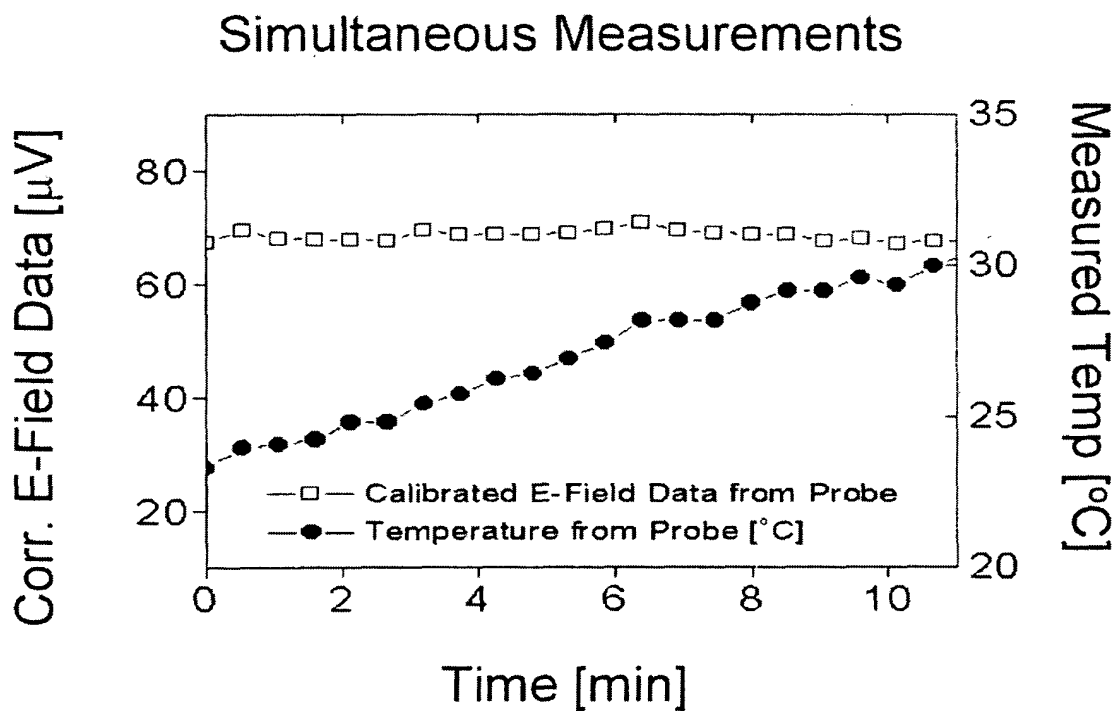


FIG. 24